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AN ADDRESS

BEFORE THE

MEDICAL SOCIETY OF NORTH CAROLINA,

AT

ITS SECOND ANNUAL MEETING,

IN RALEIGH, MAY 1851,

BY CHARLES E. JOHNSON, M. D.

Cum nil sine ordine et lege fiat, ita vitae nostrae integritas naturali lege constat, et
nobis hanc investigare legem; sed priusquam ad nos spectat cognoscere ignorantiam.

RALEIGH:
SEATON GALES, PUBLISHER, REGISTER OFFICE.

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ADDRESS.

MR. PRESIDENT AND GENTLEMEN
OF THE MEDICAL SOCIETY OF THE STATE:

It is with no ordinary feelings of embarrassment and with a profound distrust of my ability to contribute any thing of importance to your deliberations, that I appear before you on this interesting occasion, in the novel character of a Public Speaker. Although I consider myself one of the very humblest of the gallant few, who have stepped forward in the good work of Medical Reform in North Carolina, "to perform the tasks of hope in the midst of despair," yet I have not felt at liberty, from any considerations, however gratifying to me personally, to shrink from the discharge of the responsible duty which your partiality has assigned me.

Here I might be permitted to say many very civil, pleasant, and truthful things of the Medical Profession, nor would it be what the Lawyers call a "departure," since it is as clearly within the object of our Society to say a kind word of our professional brethren, as it is to inveigh against follies, vulgarities and vices, qualities which the pretenders in medicine have in common with some men of other pursuits. Whilst, therefore, I am compelled to admit that there are some practitioners of Medicine, who are pursuing in a most unworthy manner, our highly honorable and truly useful profession, I wish to be distinctly understood to assert, that neither the causes which originate or aggravate their vices are necessarily incident to the profession itself. That such an objectionable state of things should exist is, perhaps, mainly our own fault, but partly owing, I believe, to the lack of a general diffusion of useful knowledge, and to the existence on our statute book, of a very pernicious law. By reference to our Revised Statutes, it will

be found, that all sorts and degrees of *Doctors*, from the Root and Cancer and Thompsonian *Doctors*, up to the regularly educated and highly polished gentleman and physician, stand upon the same footing, and enjoy, under the law, the same privileges and immunities as to the *Doctorate*.

It is astonishing how soon one of these pretenders will learn to cheat the public. He takes all advantages and seems to have no idea of any other principle. Cunningly mysterious and secret as to the sources of his knowledge and the means which he employs in the treatment of disease, he soon becomes a trading sycophant and flatterer, pandering to the pride and pleasures of the few, and ministering to the prejudices and ignorance of the many, whilst his own mind is impenetrable to a single ray of liberal knowledge, is

“Not pierceable by power of any star.”

However, I shall not discuss here the legal privileges, nor the cherished errors of these charlatans, who are so well versed in the “gospel of enlightened selfishness” as to deny the importance of every consideration, the value of which they cannot estimate in dollars and cents. Nothing is to be made by an argument with or about them. That sort of gratuitous advertisement would only enable them the more readily to climb up into public view, confident, in their own minds, that the application of the old adage, “who shall decide when Doctors disagree,” could not result to their disadvantage. It will not be expected of me, therefore, to occupy your time with any further allusion to them particularly, as I desire to make a few remarks, before I pass on to the consideration of the proper subject of this essay, in defence of the profession of medicine, the peculiar advantages we possess for prosecuting the study of it successfully, and in praise of those noble spirits who bring to the practice of their art, learning, humanity, discretion and integrity, the four cardinal virtues of a really deserving physician.

It is as true now, as ever, that the services of a learned and skilful physician are of such vital importance to mankind, that if medical men will take care to be distinguished, as a body, for their humanity and integrity, their knowledge and acquirements, and their high-toned gentlemanly bearing and kind offices toward each other, they will soon ensure the perfect confidence and entire respect of their fellow men; whilst the blunders, ignorance and misconduct of unqualified pretenders, would attach to each undeserving one of them, agreeably to his worthlessness, rather than to the pro-

fession itself. Then, there would be more hope of a moral regeneration of the profession than croakers will allow is possible, because the sordid and selfish even will begin to discover that a thorough devotion to professional science and duty is the surest, if not the shortest, way to wealth and importance; and wisdom once acquired, no matter what the motives were which prompted the acquisition, will be faithfully cherished afterwards, not only for the advantages it can confer, but for its loveliness and virtue. *The wise man*, in describing the advantages of the love of wisdom and virtue, says: "Length of days is in her right hand, and in her left hand, riches and honor." But in my humble judgment, the members of the profession, who undertake the study and practice of medicine with a full knowledge of its relations with the various wants, pursuits and purposes of life, and with a determination to be prepared to meet these exigencies, are more deserving of praise for merit of every kind than the world is in the habit of according to them.

"A Physician skilled, our wounds to heal,
Is more than armies to the public weal,"

is the testimony of him, who, nearly a thousand years before the beginning of our era, sang of Troy and her fall; and shall it be said in this so justly called age of progress, when invention is every day discovering new and unappropriated objects of interest, and opening, by experiment and the inductive method of reasoning, new fields of enquiry in which every man may take an even start, that the humble, but earnest and truthful disciple of *ÆSCULAPIUS* is a less useful, important, and respectable member of society than he was in those ruder times? No; it cannot be. I will not believe it. The love of useful knowledge not only still exists, but even burns with a more ardent glow than at any former period of the world's history. Many circumstances conspire to produce this condition of things. It is not owing to any change in man's nature, peculiar to this age, for human nature, without doubt, has been the same in every enlightened age and nation, but results in part from the higher incentives to cultivation and the greater rewards offered to industry. Wherever these are liberally provided, there every faculty of mind and body will be exerted to the utmost, and man will furnish the most numerous and shining examples of human perfection. Besides, along with these inducements for the ardent pursuit of useful knowledge, we are the fortunate heirs of time, who have acquired by inheritance all the advantages of the expe-

rience and wisdom which history teaches. Mounted, as it were, upon the shoulders of those who have preceded us in the pathway of human progress, we enjoy a more extended horizon than met their view. No narrow limits contract the sphere of our intellectual vision, but the whole boundless world is ours. Much, too, is due to *Protestantism*, which has achieved wonders in philosophy as well as religion, and is one of the distinguishing peculiarities and most valuable characteristics of the present age. In our day, the inquirer after Catholic truth, in all the departments of knowledge, in the exact sciences and speculative philosophy, as in religion, can pursue his object with a Protestant spirit. No longer the Schools are connected with the Vatican, producing a degree of mental vassalage and subserviency, destructive of the spirit of free inquiry. No longer the word of a Priest or Master, or a dogma of the schools, is the test of truth, but the immortal mind, whose capacity for knowledge and wisdom is increased the more it is stored with useful treasures, is left that full liberty to combat error or pursue truth, which is so characteristic of the age we live in. And if it be the honor, as I believe it is, as well as the character of this age, that genius and learning, not less than christian benevolence, are chiefly busy in the habitations of men, and around the walks of daily life, and that the greatest men, as well as the best, find their themes of study, and their sources of inspiration in the moral and physical wants of mankind, then, in such an age, and especially in a country like ours, where we have in our governmental policy avoided the cherished prejudices and tolerated errors of long established despotism, on the one hand, and escaped from the greater evils of fanaticism, unrestrained by law, on the other, "he who will not reason is a *bigot*, he who cannot reason is a *fool*, and he who dares not reason is a *slave*." God has given man the peculiar faculty of reason to guide him wisely, and therefore safely, in the pursuits of life, and he who will not exercise it vigorously and healthfully in the progress of events, will presently find himself trodden down and crushed beneath the feet of the rushing multitude whose onward course he obstructs. Let not this be the lot of any one of us. On the contrary, let each of us, not only in his individual character and position, but likewise in his associated character, press on to the attainment of the objects and purposes of his high calling, emulating the lives and conduct of the masters in our profession, who have taken their stand, shoulder to shoulder, in the

foremost ranks with those philosophiers who have inscribed their names high in the temple of fame.

In the anticipation of a glorious future, the youthful and ambitious student finds the highest incentive diligently to prepare himself for the active and honorable course he means to run ; and the older ones find it necessary to labor faithfully in their several callings, that they may wear the honors of experience gracefully and not be outstripped by their more youthful and equally well informed competitors. So, as there is no privileged road to knowledge and usefulness, every competitor, whatever his age and condition in life, who struggles to win and wear a distinction worth preserving, must undergo the same painful discipline of mind and laborious exertion. But let him who runs take heed lest he fall, mistaking the feverish excitement and fitful energy of a sanguine temperament for a true and noble ambition, and a momentary popularity for lasting renown. All this is true of the study and practice of medicine, and I am persuaded that the former, if carried on with a full knowledge of its important duties and relationships with the well being of society, is ennobling in its very nature ; and that the latter is honorable and will be remunerative, when conducted under the influence of that preparation, hopefulness, and patience, which enable us to be contented with small beginnings, but keep us always ready for the gradually widening sphere of useful labors that certainly awaits us. We must remember though, if we hope to succeed, always to have some good object or useful purpose in view ; and even in our moments of relaxation from the severer studies and arduous labors of our profession, not to turn exactly into the "primrose path of dalliance," but endeavor to cultivate an acquaintance with those kindred sciences, which develop the mental faculties, and a taste for polite literature which gives them harmony, and to acquire a christian spirit, that we may have it in our power to contribute to the refinements, as well as happiness of the social circle. This course of mental gymnastics will not only enable us to investigate with facility and scrutiny the advantages and disadvantages of all the facts and theories, which are continually coming out of the prolific laboratories of medical Philosophers, but likewise to discharge the onerous duties of our profession more as a pleasure than as a task.

"Tis not for mortals to command success
But we'll do more, Sempronius, we'll deserve it."

Lord BACON regarded the science of medicine with the great-

est interest. He aimed at the relief of "man's estate," and this he believed was to be accomplished as well by mitigating human suffering as by multiplying human enjoyment. The study, therefore, of the *to kalon* and *to eidolon* of the old philosophers, however well calculated it may have been to sharpen the wit or refine the rhetoric of the schoolmen, contributed but little, according to the views of this great man, to alleviate the pains, or lessen the burdens of suffering humanity. Considered in relation to these great objects, he regarded the science of medicine as the most important department of knowledge, because it was capable of conferring the most desirable benefits on mankind.

In this connection, too, it will not be improper to elevate our thoughts and recollect that "the great physician of the soul did not disdain to be also the physician of the body." How gratifying to the mere philanthropist and physician are the views and opinions of **BACON!** How cheering and sustaining to the enlightened, laboring physician, who is at the same time a christian man, to know, that in some degree, at least, he is following the example of his *Divine Master!* Again; the dangers the medical man encounters, and encounters alone, unsupported by the emulous spirit and confidence of numbers,

— "All the while
Sonorous metal blowing martial sounds,"

are as much greater than those of the soldier in the battle field, as the calm deliberation of high purposes and conscious rectitude is superior to the mere enthusiasm of excited courage. Aye, and if he falls, as he oftentimes does, fighting with deadly disease, in his lonely walks amidst pestilence and famine, no funeral honors attend upon him, no public provisions await his family. His is the honor only to have acted well the things that belong to the sad realities and pressing necessities of human life—his the honor to have been a co-worker with those great and good men, by whose constant toils, and energetic labors and self-sacrificing spirits, mankind have been ever blessed. Hence it is with some assurance, although with an humble spirit, I assert, that the diligent and enlightened pursuit of so honorable a calling as ours, for honest purposes, is faithfully to serve God.

But I must turn from this agreeable theme, and the further elucidation of it, inviting as it is, and direct your attention to the proper subject of this essay, in which I propose to discuss the doctrine of the miasmatic origin of disease.

The acquisition of as complete and perfect a knowledge of the causes of disease, as may be attainable, is so obviously useful to the general practitioner, that it will not be necessary for me to insist upon it here; for although the nature and seat of the malady be equally well known, and the method of treatment thoroughly understood, it is nevertheless of great importance to be able to refer to its cause, which, indeed, after giving rise to the disease, may still continue to operate injuriously by its presence. Now, as this is especially true of that class of disorders, commonly denominated malarious or miasmatic diseases; and as these diseases and their causes should be particularly objects of study and inquiry with many, if not most of the physicians of North Carolina, I shall assign no other reason, because I believe I can adduce no higher one, for making their Etiology the subject of this communication. On the other hand, I do not mean to be prevented from expressing my opinion in the premises, because it is too commonly the case, that he, who undertakes to direct the professional or public mind to objects of etiological reform, is more apt to be considered a visionary theorist, than a zealous and intelligent advocate of sanitary improvements. Nor shall I bring forward, just now, any other theory to explain these phenomena, as an excuse or apology for what I have to say in opposition to the received notions upon this subject. Entertaining, as I do, the firm conviction, that the first important step in a practical investigation is the removal of any error with which it may be encumbered, it is sufficient for my present purpose, whatever my ultimate intention may be, to show that marsh miasm, in the sense of an exhalation from putrescent vegetable matter, cannot be the cause of disease. And, indeed, it would not be a difficult matter to bring forward evidence to prove that if, instead of sitting down quietly under the persuasion of the existence of this thing, marsh miasm, an inappreciable essence, about which they cannot agree, medical men and the civil authorities would earnestly and wisely exert themselves to discover the real nature and sources of morbific agents, the result would be an astonishing diminution of the liabilities to disease and the rates of mortality. It is apparent, therefore, in regard to this question, that I consider it one of some little importance, at least, to the skilful physician of the Southern States, involving as it does, the every day application almost of the principles of practical etiology, which I understand to be the establishment of the invariable relationship, as cause and ef-

fect, of those agents or influences that are capable of producing diseases and the diseases themselves. This, I believe, the sequel will show is not the case with miasm and the so-called miasmatic diseases.

I know that in advancing this opinion, I am impinging upon the current prejudices and dogmas of the schools, and, perhaps, upon the opinions of most, if not all, of the medical gentlemen here assembled. But, let me ask you, in all sincerity, have you not adopted, as a portion of your early professional education, your belief in the miasmatic origin of disease? Have you faithfully and philosophically investigated its claims to validity and truth, and after due inquiry, yielded it your full credence because you could not resist the overwhelming evidence in its favor? Or, have you not unpardonably cherished an error, because it was a popular one, or because it furnished you with an easy, if not satisfactory solution, of a difficult question? Or, have you not preferred to rest on a foregone conclusion, not, at bottom, really embracing any well tried fact, or established principle, rather than be troubled or disturbed about that on which you have already made up your minds? Or, acting still more culpably, and upon the well known maxim of BOLINGBROKE, "that whilst plain truth may influence half a score of men, mystery will lead millions by the nose," have not medical men, from the days of LANCISI down to the present time, used the term miasm or malaria, as a sort of convenient cloak for covering up their real want of information upon this subject, and thus hiding their ignorance from the public gaze? And is this the proper method, think you, of conducting an investigation after truth, reasonable truth, especially by those who seek it for the ennobling purpose of remedying the "ills that flesh is heir to?" Surely not. For, after all, the expression, marsh miasm, as denoting the cause of disease, is nothing more than a mere theoretical way of announcing the fact that something exists, of the nature and source of which we are ignorant, for the production of these diseases, since it can neither be appreciated by our senses in their natural state, nor aided by all the artificial contrivances which ingenuity can suggest, nor traced even by the presence of those agencies which are said to be capable of generating it.

Educated to believe, with entire confidence, in the theory of the miasmatic origin of disease, it was not long after I commenced the practice of my profession in one of the paludial districts of this

State, before I began to doubt the sufficiency of the facts and arguments upon which the doctrine rested. Subsequent observations, and a more enlarged and matured experience have ripened those doubts into convictions and I now regard the doctrine as a groundless assumption or pure hypothesis. Let me not, however, be misunderstood on these points. I do not mean to deny the fact, well known to every observing man, whether he be a physician or not, that a low marshy country is, generally speaking, more sickly than a higher, drier, and better ventilated one. Indeed, I may observe in this connection, that so far from denying the effect of climate and position upon organic life, I am inclined to think there is some truth in the remark of a distinguished naturalist, made at a meeting of Savans in Charleston, South Carolina, a year or two ago, that he was so well acquainted with the geological and meteorological conditions of the State in which he resided, and the influences they produced, even upon man, as to be able to decide in a given number of individuals by their peculiar characteristics, in what sections of the State a majority of them were reared. Nor do I mean to assert, what every educated person will deny, that hypotheses are altogether valueless in every scientific inquiry. The views I wish to present, and hope to maintain, are simply these: That the greater sickliness of the low lands is not owing to miasm, an exhalation from decaying vegetable matter, under certain circumstances of heat and moisture, the sense in which it is used by the schoolmen; and that hypotheses, to be of any importance in philosophical investigations, must have such a fixed and determinate value as will always render them applicable under like circumstances, and inapplicable under dissimilar ones. **LOCKE** says, "Hypotheses, if they are well made, are at least great helps to the memory, and often direct us to new discoveries." But at the same time, he gives us the wholesome caution, "that the *names* of principles deceive us not, nor impose on us, by making us receive that for an unquestionable truth, which is really at best but a very doubtful conjecture."

Sir ISAAC NEWTON says, "For the best and safest method of philosophizing seems to be, first, to inquire diligently into the properties of things, and establish those properties by experiments, and then to proceed more slowly to hypothesis for the explanation of them." But, lest it may be said that NEWTON had reference to the exact science of mathematics, listen to the language of Sir H. DAVY,

to whose particular department of philosophical knowledge, chemistry, this subject of miasmata properly belongs. He says, "I trust that our philosophers will attach no importance to hypotheses, except as leading to the research after facts, so as to be able to discard or adopt them at pleasure, treating them rather as parts of the scaffolding of the building of science, than as belonging to its foundation, materials or ornaments." It is not my purpose then, altogether, to condemn hypotheses, but to keep them in their proper places, to render them subordinate to the laws which should regulate all inquiries in the physical sciences. For example, to assume that miasm was the cause of disease, the existence of which is only inferred from the fact that disease prevails under circumstances totally inexplicable, unless upon the assumption of the existence of such a cause, would not be, I apprehend, an improper method of philosophizing, provided, on the one hand, we always had the circumstances present which were claimed as being capable of generating the cause itself, and, on the other hand, the disease invariably following as a matter of consequence. Under different circumstances, that is, in the absence of either the disease or the miasm, we should have a cause without its corresponding effect, or, what would be a much worse state of things in physics, because fatal to any theory of causation, an effect without a cause.

Now, the course of nature, so far as it has been observed, and is cognizable by our senses directly or indirectly, where we have been able by the aid of artificial contrivances, carefully to observe her laws and operations, is so uniform in respect to causes and effects, and so specific in the character of her laws, that we are bound by a correct philosophy to refer the phenomena of disease to some one or more of the appreciable states of the surrounding media, which are in any way brought into relationship with our bodies, or to intelligible internal agencies, or systemic influences, rather than to some unknown fanciful and inappreciable condition of the atmosphere. It is my purpose, therefore, in the course of my remarks, to show that the doctrine of the miasmatic origin of disease does not rest on the evidence of our senses, aided or unaided, or indeed, upon reliable evidence of any kind; but that it falls under the absurdity alluded to above, namely, of a cause without a consequence, or a consequence without a cause. Hence, the conclusion to which I have come, with others, that this theory is a groundless assumption, unsupported by such facts and principles as should

constitute the basis of every philosophical inquiry.

In mathematics, you cannot rightfully seek, much less command, a demonstration without a suitable basis of established facts or admitted axioms. So, every legitimate argument and philosophical investigation should rest upon facts and principles that are capable of application *under like circumstances* in every process of reasoning by which the inquiring mind desires to establish truth. But for the very reason that *like circumstances* are absolutely necessary for the proper display of these prerogative facts and principles, it is obviously the case, that they are inapplicable in any reasoning or argument by which it may be attempted to account for the same phenomena *under dissimilar ones*.

This statement comprises the theory of induction, and if medicine be entitled to a place among the inductive sciences, then is the principle here laid down of importance to our inquiry ; for, as every investigation of natural phenomena necessarily becomes an inquiry into causes and their effects, and unavoidably leads to a series of physical laws, so every well-grounded theory of causation must have an intimate connection with the theory of induction, as practised in the natural sciences. Induction, then, gives us the right to expect that the same result will always happen from the same cause, operating under like circumstances ; but it is of the very essence of this inference that the similarity be first shown. Without it, no process of induction can be brought to a lawful conclusion, and reason, right reason, cannot be the ground of our belief. Moreover, upon what does our idea of causation rest ? Unquestionably, the uniform observance of two facts or sequences of external nature furnishes us the only evidence, a *priori*, of causes in that sphere. The conjunction, therefore, of any two successive events may very properly become the ground of our belief in their relationship as cause and effect, provided, the second event has always been found not only to follow the first, but the second must never have been observed without the first preceding it.

MILL, in his admirable treatise on causation, defines "the cause of a phenomenon to be the antecedent or concurrence of antecedents upon which it is invariably and unconditionally consequent." And again ; "Invariable sequence, therefore, is not synonymous with causation, unless the sequence, besides being invariable, is unconditional."

Inconsiderately viewed, this absolute law of causation, whose

property and requirements are not only invariable uniformity, but unconditional consequence, might appear to shackle our experimental inquiries by narrowing down the proof too rigidly ; but a moment's reflection will satisfy us that such is not the case, as the constituent elements of a law in the science of physical etiology, the subject under inquiry, ought not to differ from those of a law in the physical sciences generally—that is, so far as the analysis has reference to the constancy of a phenomenon, or the invariableness of a relationship. For, let it be remembered that we are investigating natural phenomena and that every such inquiry is a search after causes and effects, and not a study of the calculus of probabilities, whose loose and too hasty system of generalization, attempting to define the complex before the simple is faithfully learned, has led medical minds, loaded with hypotheses, into endless vagaries and absurdities in their speculations upon the subjects of practical etiology. Recollect, too, that nature in her course is always uniform and certain, and that her order and economy are such as never to employ the wasteful expenditure of two separate and distinct causes to accomplish one and the same object, although in a series of events some one leading phenomenon may be the chief cause of many consequences, and it will be clearly seen that these principles are not too rigid for a correct philosophy.

Now let us apply this Baconian process of inductive reasoning, this well established method of conducting philosophical investigations, to our belief in the miasmatic origin of malarious diseases, and see if it is well founded. Or whether, in the first place, we have not assumed a fact, which is not proved, and then built upon it a theory, which, in the next place, we are prone to apply when no induction or proper plan of philosophizing shows that it is applicable ; thus making the whole operation not a process of inference or induction, but one of interpretation or deduction, which is, after all, the old Syllogistic method of teaching by authority, rather than according to the rules of modern philosophy, which has discovered the only true method of scientific investigation, by making facts the basis of inductions. To take these constructive formulas or syllogisms for the realities of experience and observation was the grand folly of the ancients. To employ them without due examination as to their real value and scientific applicability is the besetting pedantry of many moderns, especially wrangling theologians, who attempt to make the wisdom and laws of Omnipotence

quare with their finite notions and preconceived opinions. Carefully investigated then, I think it will be clearly seen that medical men have been reasoning backwards, as it were, upon this subject of miasm, and that too without sufficient data to conduct them to a legitimate conclusion, whilst the rules of a just and well grounded philosophy require of them not only to prove, first, the existence of the facts of the case, and their invariable relationships, but secondly, that they shall not reason from such facts, in an explanation of any phenomena, excepting *under like circumstances*

It might be well worth my while to dwell longer upon this important principle, if I had the time, instead of apologising for the length of this preliminary discussion, as the neglect of it is an error very generally prevailing with medical men, as well as others, and one which leads to an exceedingly loose and careless kind of inquiry; but I must pass on to the consideration of my subject more in detail, trusting that the array of facts and lawful inferences, which I shall adduce in support of my position, will, at least, awaken the spirit of inquiry in your minds, if they do not satisfy you of its entire correctness.

But for the purpose of doing this in a somewhat systematic manner, it will be necessary for me to state clearly, first, what is understood by the word miasm or miasmata in the sense in which it is used by those who invoke its aid in the causation of diseases; and secondly, to demonstrate the fallacy of the doctrine, by showing *we have no satisfactory proof that the morbific cause of what are called miasmatic diseases, arises from vegetable putrefaction.*

Under the first head, I shall make a few pertinent extracts from different authors, to show the sense in which the word miasm or miasmata is used, and what is understood by them to be the source of this febrile agent. These might be multiplied without number, but as there does not prevail much difference of opinion among the miasmatists upon this subject, it is quite unnecessary.

BANCROFT informs us that a humid soil abounding in vegetable remains, and acted on by heat, the range of which is from 45 to 100 Fahrenheit, is the most favorable for the extrication of miasmata.

DR. CHARLES CALDWELL, of Transylvania University, in a prize essay upon the subject of miasm, expresses the following opinion as to the disease producing properties of decomposing vegetable matter: "Is the city commercial, and situated on navigable water?

Let not the wharves be built entirely of wood. Their facing, at least, should consist of stone or brick, else they will become, in time, masses of dissolving vegetable matter, and abundant sources of febrile miasm. That the cities in the United States suffer in their health from this cause, cannot be doubted. Piles of decaying timber, alternately wet and dry, and exposed to the ardor of an American summer sun, must produce malaria as certainly and as naturally as the influence of spring promotes vegetation, and the rigors of winter suspend it."

Dr. EBERLE, article miasmata, assures us that "Wherever vegetable matter meets with sufficient heat and moisture to cause it to enter into humid decomposition, there miasmata will be evolved, &c.

CLYMER, in his "treatise on fevers," declares "Whatever its constitution or essence may be, it at any rate appears evident, that in order to its production, there must be present a certain quantity of moisture, vegetable matter in a state of decomposition, and a warm temperature."

Professor WOOD, of the University of Pennsylvania, in his work on the practice of medicine, article miasma, observes that, "So strong indeed, is the evidence of this fact, that the great mass of observers, ever since the time of Lancisi, have agreed and still agree, in ascribing the miasmatic influence, whatever may be its nature, to organic and especially vegetable decomposition."

Agreeably to ELLIOTSTON, a distinguished practitioner of London, "The exciting cause of ague, the true indispensable cause of it, I believe to be an exhalation from decaying vegetable matter," and that "a certain degree of moisture is necessary for the fermentation and putrefaction of vegetable matter, which fermentation and putrefaction give rise to the exhalations which produce ague." Whilst McCULLOCK, who stands at the head of the miasmatists, in his treatise on malaria, arrives at the opinion, "That the presence of vegetables or vegetable matter in some mode or form, is necessary to the extrication of malaria; while the conclusion has sometimes been, that it is a production formed between the living vegetable and water; more generally that it is generated between that and the latter, in some stage intermediate between life and absolute decomposition, or lastly, that it is the consequence of absolute putrefaction."

From the above extracts, which have been selected without much care, it will be seen that miasm consists mainly, if not entire-

ly, of an exhalation from decomposing vegetable matter, under such circumstances of heat and moisture as are capable of producing putrefaction.

Now, as it is not necessary for the object of this investigation that I should stop here to inquire into the slight differences in opinion amongst the miasmatists, as to the specific amount of heat, moisture, and vegetable, or organic matter, which it is necessary to have for the purpose of evolving this subtle poison, since we may very naturally conclude, we shall have the greater product, the more material we have out of which to form it, I shall proceed at once to show, *under the second head*, by extracts from the most reliable authors, and by adducing instances of undoubted truth, that we have miasmatic diseases prevailing in situations so totally different from each other, it is impossible, under the rules of a correct philosophy, to ascribe them to effluvia from decaying vegetable matter. In other words, that we are sometimes exempt from them where vegetation and decaying vegetable matter, together with heat and moisture, sufficient to produce putrefaction are abundant, and then again, have them committing fearful ravages, where there is no vegetable matter to decay, and where there is no moisture to aid putrefaction.

Dr. DRAKE, in his work on the principle diseases of the valley of North America, speaking of the Miami valley, says: "The upper portions of this basin abound in wet and marshy prairies, woodland swamps, and ponds, or small lakes of pure water. The Southern portions offer but little of either on the uplands; but in the wide valleys of both the miamies and along all their larger tributaries every variety of wet surface was found in spring and early summer, when settlements were first made: by clearing, cultivation and draining, however, a much drier condition has been produced. At the same time, mill-ponds have greatly multiplied, and two canals, one from Cincinnati to Dayton, and thence to Lake Erie, and the other from the former city to Brookville, and Cambridge, in the State of Indiana, have been excavated. In the month of June, they are annually emptied of water, and the mud accumulated in their bottoms, is scraped out upon their banks." * * *

"Through the whole distance, it (the canal to Dayton,) traverses a fertile valley from one to three miles in width, abounding in diluvial terraces and low alluvial bottoms, to which the present diminutive stream bears in the volume of its waters no assignable pro-

portions. This valley is, in fact, the obsolete bed of one of those vast river currents which once flowed from the north into the trough of the Ohio river."

Here we unquestionably have an abundance of the materials, heat, moisture and vegetable matter, for the generation of miasm; and yet the same writer who has furnished us with the above description, declares, "It does not appear that the inhabitants of the region through which the canals were dug were injured by the process, or by letting in the water when they were finished; nor have I been able to collect any reliable evidence, that the annual emptyings and cleanings out, have been productive of fever."

Again, on the authority of Dr. HENTON, he assures us, there is on Paint Creek, in Ohio, a mill pond covering over sixty acres of bottom land, near the village of Washington, which is generally drained off about the first of June, after having been submerged all the previous autumn, winter, and spring; and yet it was never known to cause sickness in the neighborhood.

Pensacola bay is several miles in extent, and bounded on the west side, from the Gulf coast up to its head, with sand beach of limited extent, in the midst of which are found marshes of fresh water covered with cypress, magnolia, subaquatic plants and shrubs, yet it is quite healthy, excepting near the head of the bay, where the Escambia river, coming down from Alabama, empties. Here it has been notoriously sickly always, notwithstanding the temperature and moisture are the same, as they are lower down the bay and the extent of marsh only a trifle greater.

My present object does not make it necessary for me to describe particularly the topography of the Delta of the Mississippi, further than to state, what every one knows, that it consist of alluvial deposits, with an abundant and luxuriant vegetable growth.—Such a condition of things, in so hot a climate, might, *a priori*, be claimed by the miasmatist as the very focus of miasms; but let us see what are the opinions of some distinguished medical gentlemen, themselves believers in the doctrine of the miasmatic origin of disease, upon this subject.

The inhabitants of the Belize, writes Dr. DRAKE, suffer much less from miasmatic diseases than those who reside along the rivers of the interior of Louisiana, notwithstanding vegetation, heat, and moisture, are as abundant at the Belize as more inland.—This, he and others attempt to explain, by supposing that the salt

water of the Gulf waves prevents the extrication of miasmata at the Belize. The same reason is given for the comparative healthfulness of Key West; and also to explain, why Fort Pike is less liable to malarious diseases than Fort Wood; but it will be seen presently from the statements of MARCHETTI, that whatever sanatory properties salt water may have in this country, under such circumstances, it has no such virtues in Italy. As to the influence of salt water in preserving the health of marshy places, MARCHETTI, in his medical topography and statistics of the Tuscan Maremma, speaking of the cause of the fever, is decidedly of opinion, that "the mixture of salt with fresh water greatly increases the intensity of the miasms, because pestiferous marshes have become innocuous as soon as the ingress of salt water has been prevented." He gives instances of this fact, one in particular. Near Viareggio, a nice and pleasant little town has sprung up and is used as a retreat, or watering place, in those very months when it was formerly, or before the salt water was shut off from its marshes, almost pestilential. In a word he insists that the cause of fever in the Maremma is an emanation from decomposing animal matter in the marshes, and that the "humidity of the atmosphere, vegetable decomposition, and changes of temperature, are only auxilliaries, as these conditions are to be found in districts not subject to intermittent and remittent fevers."

DR. EBERLE, one of our standard writers upon such subjects, confirms this statement of MARCHETTI, upon the opinion of MONFALCON, and his own observations. He says, "A mixture of fresh and salt water in marshes appears to enhance the copiousness and virulence of miasmata to a very obvious degree. "It is a singular fact," says the Doctor, "that the water of the sea is much more apt to enter into putrefactive decomposition than fresh water; and this, no doubt, depends on the great quantity of organic matter which it contains."

But to return to the delta of the Mississippi. Fort Pike is thirty five miles north-east from New Orleans, and situated on the Island of Petites Coquilles. This Island, elevated about two feet above the Gulf, enjoys a rich productive soil, composed of shells, argillaceous and vegetable matter. It is washed on one side by the waters of Pearl river, and intersected with numerous bayous and marshes, and has pools of stagnant water, but notwithstanding these inviting circumstances, it has never been visited by yellow fever, and autumnal fevers even, are very scarce.*

* Army Statistical Reports

Fort Wood is seven miles from Fort Pike, and situated on the south side of the channel, Chef Mentieur, one of the connecting Straits, between Lake Ponchartrain and Lake Borgne. In its rear there are some cypress and fresh water swamps of limited extent, which are annually replenished by rains with fresh water, like the same character of swamp and marsh in the rear of the "coasts," from New Orleans to Bayous La Fourche and Plaquemine. This situation is decidedly insalubrious, according to the same authority, A. S. Reports, which makes Fort Pike comparatively healthy; and Dr. DRAKE and others endeavor to account for the difference, by the presence of salt water in the swamps of the last mentioned place. The insufficiency of this explanation, I have already denied upon competent authority; but even if it were true, the difficulty would still remain of accounting for the healthiness of the "coasts," as they are called, or banks of the Mississippi, from New Orleans to the outlets of Bayous La Fourche and Plaquemine, which the swamps and marshes about Fort Wood closely resemble, and which Dr. DRAKE assures us, are peculiarly exempt from autumnal diseases.

Dr. CARTWRIGHT, a gentleman of great distinction, in an article in the Western Journal of Medicine and Surgery, Vol. 1., is reduced to the necessity of attributing health preserving properties to the water lily, (*Jussiaea Grandiflora*,) to save himself from the confession that there is no truth in the miasmatic hypothesis. He says: "The country immediately north of the line bounding the growth of the floating plant, (which is about the 30 deg. north latitude,) like that south of the 30 deg., is alluvial, contains lakes, swamps, and stagnant water, is covered with nearly the same vegetable productions; but its atmosphere is evidently insalubrious, its stagnant waters impure, its inhabitants sickly, and human life of short duration, while the country of the aquatic plant, immediately south of it, contains a wholesome atmosphere, pure water, healthy and long lived inhabitants." In some situations, within the region of the floating plant, where the Doctor thought if the country contained sickly spots anywhere, they richly deserved to be so considered, he found the inhabitants altogether exempt from autumnal diseases.

In regard to the value, however, of this theory of Dr. CARTWRIGHT, Dr. DRAKE remarks, that "it is at least an open question, as the "coasts," or banks of the Mississippi, from New Orleans to the

outlets of Bayou Plaquemine and Bayou La Fourche, lying nearly north of the region of Jussiaea Grandiflora, are equally free from autumnal diseases and contains as many aged inhabitants."

Here, then, we have, confessedly an ample supply of all the materials required by the miasmatists for the manufacture of malaria; but, indeed, the country seems to be so singularly and unexpectedly exempt from miasmatic diseases, that every one is looking out for some countervailing agency, some means of neutralizing the marsh poison, which each believes must be generated under circumstances so favorable for its evolution. Each learned Doctor has his own peculiar views upon the subject, whilst the common people generally say it is owing to the prevalence of sea breezes; but why do not the sea breezes, felt with equal force and constancy at the head of Pensacola bay, where the Escambia river empties, and where there is one little marsh of some one or two miles in extent, instead of a whole region of marshes, preserve that locality from the reputation of being one of the most insalubrious spots on the face of the earth.*

So, likewise, in our own State, we have extensive tracts of swamp land, in which a great number of laborers are engaged every year in getting shingles. These laborers, not only work during the day in these swamps, and drink swamp water, which is greatly discolored by decaying vegetable matter, but sleep in them at night, in open huts or rudely constructed shanties; yet they are decidedly the healthiest portion of the laboring classes in those parts of the State. Now, this cannot be owing, as some pretend to believe, to the fact, that as the swamps are not entirely cleared and drained, vegetable decomposition does not take place, because that is palpably an error. Our own senses teach us such is not the case, and that vegetable decomposition does take place to an enormous extent. The whole superstratum, which is oftentimes many feet in thickness, consists of the debris of vegetable and animal matter; for these swamps are scarcely more noted for their luxuriant vegetation, than they are for their abundance of insects and reptiles. Besides, I am informed by MR. REDDING L. MYERS, a respectable gentleman of the town of Washington, who, as assistant engineer, had charge, in part, of the workmen employed upon the public lands about Pungo Lake, that they were remarkably healthy. Here, an extensive and systematic plan of drainage, by canalizing and ditching, exposed the laborers to the exhalations from the soil, under a variety

* Lind and others.

of circumstances, as well upon the prairie marshes, as in the open swamps and close jungles; and yet they scarcely had any fever amongst them, or required the attentions of a physician, during the two or three years they were engaged in this service.

The Antilles, Brazil, East Indias, Europe, and other parts of the earth, furnish us examples of the same kind. British Guiana, with its wet and dry seasons, and extensive alluvial marshes, which have been reclaimed from the sea by a most expensive and permanent system of diking, together with its culture of Sugar, Rice, Indigo, &c., is represented by a writer in the British and Foreign Medico-chirurgical Review for 1850, as "among the most healthy of the West Indian Colonies, and capable of being healthfully tenanted by European residents," notwithstanding "its wide alluvial tracts."

FURGERSON says :—The town of New Amsterdam, Berbice, is situated within short musket shot to leeward of a most offensive swamp, in the direct tract of a strong tradewind that blows night and day, and frequently pollutes even the sleeping apartments of the inhabitants, with the stench of the swamps; yet it had produced no endemic fever worthy of notice, even among the newly arrived, for a period of years previously to my visiting that colony."

The town of Kingston, in the Island of St. Vincent, is so situated, says Report Armstrong, "as to have all the elements necessary for the production of this vegeto-animal poison, heat, moisture, decayed and decaying vegetable matter, with as large a proportion of reptiles, insects and other animal matter as is found in other tropical countries; yet strange to say, the town of Kingston is one of the most healthy spots in the West Indias. I was informed by the staff surgeon to the forces, who had long resided there, that *it was as healthy as the most favorable spot in England.*

Brazil, too, is said to be entirely exempt from endemics, although it has an extremely fertile soil, a sultry atmosphere, and a most magnificent profusion of vegetation of almost endless variety. This vast empire is intersected every where with navigable streams, which pour their waters through a common mouth into the Ocean, and indented along its sea coast, of more than two thousand miles in extent, with numerous beautiful and safe harbors. The Delta of the Amazon alone spreads along the Atlantic shore, on either side of the equator, to the breadth of one hundred and fifty miles, and its length from the ocean to the farthest point where the ebbing and

flowing of the regular tides are felt, and where the innumerable Islands and labyrinth of channels begin, is over six hundred miles. The intelligent American travellers, Kidder and Edwards, spent several years in this country, and concur in representing every portion of it, even the entire valley of the Amazon, embracing nearly one half of this vast territory, as salubrious in a remarkable degree. The latter, Edwards, says he never saw but one case of Intermittent during the three years he remained in the country, and that, he cured with a single dose of medicine.

Dr. HORNER, of the U. S. Navy, in describing the topography of the city of Rio Janeiro, says: "The proximity of the Ocean, the great size of the harbor, the great height of the land about it, the many hills, narrow streets, and high temperature; keep Rio almost without cessation immersed in a heavy, sultry atmosphere, rendered more disagreeable by want of cleanliness and the exhalations from the ravines and marshy grounds in its rear"—yet Rio, notwithstanding, is considered by travellers generally, who have spent some time there, as well as in other parts of Brazil; to be healthy. And WALSH informs us that for many weeks at a time, during the rainy season, there were several hours in each day when his clothes would be wet on him; and that he oftentimes put on wet clothes in the morning, which had remained wet all night; and that whenever the sun shone out, it was so intensely hot, that he went smoking along in his wet clothes, the water from which was exhaling by heat and dissolving into vapor. "Such weather," to use his own language, "in Africa, under the same latitude, no human being could bear; but not so in Brazil; no one is affected by those states of the atmosphere which are so fatal elsewhere. It has with some reason, therefore, grown into a proverb, that it is a country where a physician cannot live, and yet where he never dies."

New South Wales, including South Australia, and Australia Felix, has a wet and dry season, an abundance of streams, bays, estuaries, swamps and ponds of stagnant water, and in some places, particularly about its towns, a rich and highly productive soil. It is likewise subject to inundations from the rivers, and its alluvial swamps to overflows from the sea; yet notwithstanding all these indications of a sickly climate, New South Wales is exceedingly healthy and free from endemics.*

"The Island of Java" says, SIR STANFORD RAFFLES, one of the lieutenant Governors of that Island and its dependencies, "stands

* Malte Brun and Byrne.

on a level, in point of salubrity, with the very healthiest parts of British India, or any tropical country in the world, although it abounds in a most luxuriant vegetation, and in numberless streams cataracts and rivulets, which are tamed to the peasants will. In the hottest and driest season, they are made to retain some of their water, which the farmer directs into endless conduits and canals to irrigate the lands, which he has laid in terraces for its reception. It thence descends to the plains and spreads *over them* shedding fertility wherever it flows, till at last, by innumerable outlets it discharges itself into the sea."

This same system of artificial irrigation, which is so innocuous in Java, is believed by Dr. WILSON, in his medical notes on China, to be the cause of the unhealthiness of the Islands of Chusan and Hong Kong : for he says, "The meteoric influences and the aspect of the country appear highly favorable to health—what is detrimental is believed to be chiefly the wilful work of man's hands, or of perverse ignorance."

Mr. PEALE, the Geologist to the exploring expedition, under Capt. Wilkes, in a letter to Dr. DUNGLESON, published in the Medical Examiner for 1843, states, that they visited situations in the course of their travels amongst the Friendly, Society, Fegee, Samoan and Sandwich Islands, where the inhabitants subsisted, in part, upon the root of the Tarro plant, which requires to be cultivated, like our rice, in shallow fresh water ponds and marshes, and where natural marshes do not occur, they are artificially constructed by the natives. He states further, that they often found their towns situated in the midst of these "Tarro patches," which plentifully supplied the residences with mosquitoes and other insects, and the stench of the marshes; yet neither the officers, nor men, nor the scientific corps, suffered in consequence of their exposure although they were in the midst of the exhalations from these marshes day and night, living and sleeping, owing to "the shore duties of the service, in the midst of marsh stenches and mosquitoes, when the days were hot, and the huts open and exposed."

Capt. Wilkes mentions that these Islands are hot, moist, fertile, and remarkably healthy.

On the other hand, Mr. PEALE observes that almost every one of the expedition, suffered more or less from endemic diseases, after their arrival on our north-west coast, and had encamped upon the Willamette river, in Oregon, where there were no marshy grounds, ex-

cessive moisture, stagnant ponds, or other sources of miasm, as both the earth and the atmosphere were remarkably dry.

Dr. HOPE, of Princeton, in a letter to Prof. J. K. MITCHELL, of Philadelphia, describes the Island of Singapore, which lies within the tropics, and abounds in streams, marshes, ponds and pools of stagnant water, with its jungles and a most luxuriant vegetation in many places, of astonishingly rapid growth, and equally rapid decay, as being very rarely visited by fevers of any kind, and when they did occur, were from "imprudent exposure to fatigue or the sun." "Singapore," says the Doctor, "is considered a kind of Sanatarium for the oriental invalids, who go thither, from every quarter of the eastern world, to escape from malaria or to recover from chronic diseases."

In Ireland, emphatically a country of swamps, bogs and ponds, the inhabitants in the linen manufacturing districts rot their flax in dead water ponds and ditches, thus filling the whole atmosphere with the effluvia from this mass of decomposing vegetable matter; yet, Ireland, even under such favorable circumstances for the production of miasmata, is not subject to endemics of intermittent and remittent fevers.

Dr. BELL, in an article "On miasm as an alleged cause of fevers," in the 11th vol. of the Philadelphia Medical Journal, says: "The inhabitants of every Dutch house, ought, from the above creed, to be attacked annually with intermittent fevers, since to each is attached a summer house, situated immediately over a small stagnant canal, covered with vegetable remains, and exposed to the sun's rays. Here, hours, especially in the evening, are spent by the family, without the members of it being afflicted with disease."

Sion, or what is called the "*Jews' Quarter*," in Rome, is represented by Dr. JAMES JOHNSON, in his work on change of air, as the dirtiest, filthiest, dampest, "*and the healthiest spot in that famous city.*" Being down upon the shores of the Tiber, and more exposed to the vapors from the river, and wet river banks, than any other portion of the Roman Capital, it ought to be sickly according to the views of the miasmatists, but "it is quite free from the fatal malaria."

So, Lisbon, one of the filthiest towns in all Europe, cannot carry on gardening, which, in so dry a country, is of the utmost importance to every family, without artificial irrigation, and that the inhabitants may be able to accomplish this desirable purpose,

the water is collected during the rainy season in the cisterns in their gardens, and under their houses. The water, says FERGUSON, being of utmost importance, is husbanded carefully, for several months in the dry season. Diminishing daily by drainage and evaporation, it, of course, gets into a most concentrated state of foulness and putridity, with a thick green vegetable scum upon it ; yet, no one ever dreamed of its producing fever, although the most ignorant native is well aware, that were he to cross the river, and sleep on the shores of the Alentejo, where a particle of water, at that season, had not been seen for months, and where water, being absorbed into the sand as soon as it fell, was never known to be putrid, he would run the greatest risk of being seized with remittent fever."* The same author gives us another example of a somewhat similar nature. " In the West India Sugar Ships," he observes, " the drainage of the Sugar, mixed with the bilge water of the hold, creates a stench that is absolutely suffocating to those unaccustomed to it, yet it is denied that malaria or malarious diseases are generated even from this combination."

So the water of the Thames, according to Dr. DUNGLISON, loaded with all the filth and soluble materials, animal and vegetable, which it acquires in its course to the sea, is nevertheless the best water to take on a long voyage ; for having undergone a process of fermentation, or self purification, it keeps sweet and potable a great while. Accordingly, merchantmen and ships of war fill with it their water tanks, which are situated immediately under the hammocks and berths of the men. Now, during the fermentation of the water, which takes place after a little while, the sleeping apartments, and, indeed, all portions of the ship, are filled with an almost intolerable stench ; yet it never produces disease.

I shall now call your attention to another class of facts. In Guinea, according to LIND and other writers, during the entire period of continued heat and drought, which sometimes lasts for six or eight months, when every thing is parched up, and the earth is literally baked and cracked open in great fissures, and the rivers dried up, or restricted to very narrow channels, leaving a large portion of their alluvial beds and slimy mud banks exposed to the rays of a burning sun, there is no disease. But when the rains have set in, and the parched earth is soaked with water, and the rivers begin to fill up, diseases become rife and the mortality is great.

* Article on Marsh Poison, &c.

Egypt, too, which is inundated or partially covered by the overflowing waters of the Nile for nearly three-fourths of the year, and which has its atmosphere filled with the exhalations from stagnant lakes, canals and pools, and the drying up of its deep alluvial soil by the action of a powerful sun, producing an excessive evaporation, enjoys freedom from endemics of intermittent and remittent diseases ; and, indeed, since the days of the celebrated VOLNEY, travellers generally have agreed that its climate was salubrious—much more so than Cypress and other parts of the Levant, less abundantly furnished with the supposed sources of miasm. Let us take a single example of this fact. Menouf, the capital of one of the provinces of lower Egypt, although its south and west walls are situated on the banks of a very shallow canal, and near to another still shallower, neither being navigable, and the latter consisting chiefly of stagnant pools, is, notwithstanding, a remarkably healthy place. Besides these canals, there are, in the immediate neighborhood of the town, ponds of dead water in which the inhabitants rot their flax, with here and there a burying ground, which is overflowed by the high waters from the Nile ; but as the waters do not remain on the lands about Menouf as long as they do over most other parts of the delta, Surgeon CARRIE thinks this may be the reason of its extreme healthiness. So, in our own State, on the lower Roanoke, where the bottom lands are guarded from the river inundations by diking, in August last, owing to a very unusual rise in the river, the levees gave way in many places, and large farms and extensive tracts of land, heretofore protected against such inundations, were overflowed. When this disastrous rise in the river occurred, the farms were covered with luxuriant growing crops, and an abundance of vegetable matter, in a succulent state, occupied the bottom lands and marshes. In many places, all this mass of vegetable matter was destroyed entirely, and left, by the subsidence of the flood, to putrefy upon the land, filling the whole air with its stench, whilst the earth's surface, by excessive evaporation, during an unusually warm and long autumn, became perfectly dry and even baked, cracking open in many places with long and deep fissures. Such was particularly the case with regard to the bottom lands and marshes in the counties of Northampton, Halifax and Bertie ; and, yet, I am informed by gentlemen of high intelligence and standing, part owners of these lands, that contrary to all expectation, it was an unusually healthy season.

Such a state of dryness, I must admit, perhaps, according to BANCROFT, ought not to have evolved miasm; but it is precisely under such a condition of the atmosphere and earth's surface, that diseases are often violent, and the mortality greatest, agreeably to BROWN, PRINGLE, FORDYCE, FERGUSON, and others; and I now propose to examine the subject in that point of view. The last named writer, a standard authority, insists, "that putrefaction and the matter of disease are altogether distinct and independent; that the one travels beyond the other without producing the smallest bad effects; and that however frequently they may be found in company, they have no necessary connection;" and that the cause of disease "cannot emanate from vegetable putrefaction, but is found most virulent and abundant on the driest surfaces; often, where vegetation never existed nor could exist, &c."* He also says "A year of stunted vegetation, through dry seasons and uncommon drought, is infallibly a year of pestilence to the greater part of the West India Islands;" and that "The most ignorant peasant of Lincolnshire knows that there is nothing to be apprehended from the ditches of his farm, till they have been dried up by the summer heat." Much autumnal disease was likewise observed by him in South Holland, in 1794, after a hot dry summer, at the encampments of the British forces, at Rosendaal and Oosterhout, where the surface was a level plain of dry sand, without vegetation, and where no vegetation could exist, except the stunted heath plant, and where all the wells of the camps were plentifully supplied with sweet and potable water.

PRINGLE also bears testimony to the insalubrity of the dry, unproductive sandy plains of Dutch Brabant, whilst FORDYCE informs us that the British Armies, when encamped upon the pure sandy plains of Flanders in 1810 and 1811, were greatly troubled with intermittents and remittents; and, also, that there is a region in Peru, barren from want of water and vegetation, and yet nearly uninhabitable from the prevalence of virulent fevers.

The result of FERGUSON's observations on the medical topography of Spain, is, "that in the most unhealthy parts of Spain, we may, in vain, towards the close of summer, look for lakes, marshes, ditches, pools, or even vegetation; and that Spain, generally speaking, though as prolific of endemic fevers as Walcheren, is, beyond all doubt, one of the driest countries in Europe, and it is not till it has again been made one of the wettest, by the periodical rains, with

* Article on Marsh Poison, &c.

its vegetation and aquatic weeds restored, that it can be called healthy, or even habitable, with any degree of safety."

Dr. BROWN, a decided miasmatist, confirms this statement, and adds: "He has repeatedly observed that cases of fever and ague abounded in parts of Estremadura, so remote from the Gadiana or any stream, that no influence from visible water or dampness could be supposed to have a share in their production."*

Bishop HEBER, in his account of India, according to MITCHELL, says, the wood tracts of Nepaul and Malwa, having neither swamps nor perceptible moisture, in summer and autumn are abandoned, not only by man, but even by the birds and beasts, in consequence of their pestilential character. In regard to the insalubrity of woodlands, MARCHETTI, before quoted, observes that, "The presence of crowded and extended woods, according to some, and on the contrary, their destruction, according to others, cause malaria. TARGIONI, on the authority of Doxi and others, considered woods injurious, not only for being liable to retain and imprison the principle constituting malaria, but also from being, as he believed, capable of producing them. Such a disparity of opinion proves, in my judgment, that there are circumstances in which a too extensive and general clearing of woods may be equally injurious, as allowing trees and shrubs to increase and multiply without the regulation of man. We find certain districts and houses with a perfectly healthy atmosphere, in the midst of extended woods, while others in similar situations, suffer from malaria."

Malta is a barren rocky Island, considerably elevated above the sea, in some places as much as twelve hundred feet. Its substratum consists of calcarious sandstone, scantily covered with soil, most of which has been carried thither. It has no marshes, stagnant pools, swampy grounds, lakes or rivers, yet Maj. TULLOCK asserts that it is quite sickly. The same is true of the town of Gibraltar, which is built on a bed of dry red sand, at the foot of the rock of that name, and has no ponds or marshes to furnish decomposing vegetable matter to generate disease. So, too, with one of the Isles de Loss, near Sierra Leone, about a mile in diameter, and at its centre as much as three hundred feet above the level of the sea. It has no marsh, no swamp, very little soil, and only one small peice of arable land, but it is represented by BOYLE as one of the most insalubrious spots on the African coast.

*Cyclopaedia of Practical Medicine.

Here I might be satisfied to rest the discussion of this question, having already subjected it to the test of the *experimentum crucis*; but I prefer to examine it still further, and under another point of view, lest the miasmatists may think I have not furnished them difficulties enough to solve.

In a great many parts of Kentucky, Tennessee, North Alabama, North Carolina and Virginia, where the country is dry and ridgy, and in many places quite elevated, autumnal fevers occur upon the highest lands, where there is comparatively no moisture, and where vegetable decomposition, to the extent of poisoning the atmosphere, is never suspected. Professor WOOD attributes the prevalence of intermittent and remittent fevers, under such circumstances, to an unaccountable epidemic influence, and not alone to the presence of marsh poison; for, he says, speaking of the effects of epidemic influences: "Hence, probably, the late prevalence of intermittent and remittent fevers, during the summer and autumn, in portions of the middle and eastern States, in which these diseases were formerly almost unknown; while the circumstances of these regions, in relation to the production of miasmata, remained, so far as could be discovered, the same as in preceding years." The learned professor does not exactly acknowledge here the agency of two separate and distinct causes for the production of one and the same effect, for he seems to be fully aware how apparently inconsistent this statement is with his previously expressed opinion of the specific febrile character of miasmata in these diseases, and therefore endeavors to reconcile them, by supposing that there is always, and in every place, even in the healthiest situations, where there is no unusual amount of moisture, heat and vegetation, and where intermittent and remittent fevers have been hitherto unknown, a sufficiency of exhalation from decomposing vegetable matter to produce these diseases, if there was only present a little epidemic yeast to enliven the mass. Now this view of the matter, in my humble judgment, necessarily leads to one of two conclusions—either to the employment of two causes for one effect, which I have elsewhere stated to be at variance with the order and economy of nature, or amounts to a begging of the question. But let that pass.

Dr. ROBERT JACKSON, in his work on the diseases of the West Indies, informs us, that the same fevers occur in those Islands amongst the series of mountain ridges, not exposed to the exhalations from swampy and low grounds, and at an elevation of six or

seven hundred feet above the level of the sea ; and Dr. JAS. JOHNSON, in his work on tropical climates, asserts, that these diseases prevail in the high hills and thickly wooded parts of the mountain ridges of the Island of Ceylon, and on the secondary mountains and primitive ridges in Sicily ; while Dr. HEYNE attempts to account for their occurrence amongst the rocky, wooded hills, in the Madras Presidency, distant from any acknowledged sources of miasms, by supposing them to be owing to some magnetie influence, dependant upon the ferruginous character of the rocks. In the same manner, other distinguished observers have insisted that these diseases have been known to originate and prevail extensively in argillaceous soil, where no vegetable putrefaction was going on, or at all suspected.* The celebrated LINNÆUS contended in his inaugural essay, that periodical fevers originated in all those places where the soil abounds in clay, and only in such places ; and Von AENVANK, a Netherlander, endeavors to explain their prevalence in argillaceous soils, by supposing that clay possessed the property of absorbing oxygen from the atmospheric air and thus impairing its purity.

From Dr. DUNGLISON, we learn that in the summer and autumn of 1828, the high, ridgy, and beautiful shores of Long Island, known as the Narrows, received a fearful visitation from intermittent and remittent fevers, without any assignable cause for it, and when scarcely a single case of either had been known there for forty years previously ; nor does it appear, says the Doctor, to have prevailed there since. The same thing has occurred upon the Island of Portsea, on which Plymouth, in England, is situated. Many years ago, it was believed to be entirely freed from malarious diseases by drainage ; but they have recently returned again, not only to the best drained portions of the Island, but even to parts of it which were never before subject to them.

So, in our own State, in 1846 and 1847, districts of country hitherto exempt from autumnal fevers, were terribly scourged by them, notwithstanding there was no apparent difference in the amount of moisture, heat and growth of vegetable matter, from what was usual in such places. The tract of country dividing the waters of Roanoke and Tar Rivers, and extending from the neighborhood of Weldon on the former river, through portions of the counties of Halifax, Warren, Franklin, Granville and Person, having an argillaceous and gravelly soil, with white and red quartz and granitic formation, the purest and finest springs and wells of

*Chisholm, Brown, and others.

water, and with a growth chiefly of oak, hickory and dogwood, was, during these years, visited by autumnal diseases, and in many places through this region, old men, heads of large families, who had never taken a dose of medicine or seen a case of ague and fever, or bilious fever, in their lives, became as familiar with these disorders and their treatment, as with household words. Other portions of our State, extending even into the gorges of the mountains, heretofore unsought by these maladies, suffered in a like unaccountable manner.

These are some of the facts and circumstances which have induced me to abandon the miasmatic hypothesis; for, whatever this febrile agent may be, if different from the appreciable states of the atmosphere and the earth's surface, it cannot be traced, as I think I have conclusively shown, by the presence of those conditions of moisture, heat, and vegetation, which are claimed as indispensable for its production. Nor has any chemical analysis, so far, been able to detect it; nor microscopic investigation, although conducted with all the diligence and zeal incident to a fashionable pursuit, as yet revealed it. M. JULIA, a writer of considerable distinction on marsh miasm, assures us that, after sixty trials to detect the chemical and physical properties of this poison in the air of several very insalubrious marshes, by the most searching analysis, in each instance he found only such constituent principles as are contained in the purest atmospheric air.

MOSCHATI and BROSCI also examined analytically the air of rice fields, and some notoriously unhealthy spots in the papal States, with nearly like results; while "M. DESEYE obtained in the most confined and unhealthy marshes, as on the most exposed hills, seventy-eight parts of Nitrogen, twenty-one of Oxygen, and one of Carbonic acid."

Such is the view of this subject which I have thought proper to present for your consideration; and these the facts which the brief space allotted to an address of this kind has permitted me to bring forward in support of my position. Nevertheless, I believe they will, under the operation of the rule which I have laid down for our government in the study of all questions in physical etiology, the scientific value and applicability of which no one can deny, furnish sufficient evidence to convince us that there is no truth in the *doctrine of the miasmatic origin of disease.*

